# UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 2366

MSAS NO. 110

OVER THE

MISSISSIPPI RIVER

DISTRICT 2 - BELTRAMI COUNTY, CITY OF BEMIDJI

PREPARED FOR THE

MINNESOTA DEPARTMENT OF TRANSPORTATION

BY

COLLINS ENGINEERS, INC.

JOB NO. 5221 (CEI 34)

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 2366 were found to be in good (East and West Abutments) to satisfactory (Piers 1 and 2) condition with no defects of structural significance. The concrete deterioration at the piers has progressed since the previous inspection, but overall has still not appreciably compromised the structural integrity of the structure. The channel bottom around the substructure units was well established and in stable condition with no evidence of significant scour and no appreciable changes since the previous inspection.

INSPECTION FINDINGS:

(A) Moderate to heavy scaling was present around much of the perimeter of the piers in a horizontal band typically located between 3.5 feet above and 1 foot below the waterline, with typical penetrations of 2 to 3 inches and maximum penetrations of 6 to 12 inches. Corroded steel reinforcing with minor section losses was randomly exposed in the scaling.

(B) Below water (below the band of scaling described in A), the concrete of the piers exhibited only light scaling and random locations of poor consolidation and section loss with penetrations of up to 2 inch.

(C) Map cracking, hairline to 1/16-inch-wide in size, and related impending spalls were observed on the West Abutment from the channel bottom to 3 feet above the channel bottom.

(D) A moderate amount of debris, including timber drift, assorted garbage, and a shopping cart, was observed on the channel bottom between the West Abutment and Pier 1. No notable scour and no foundation exposure were found at any of the substructure units.

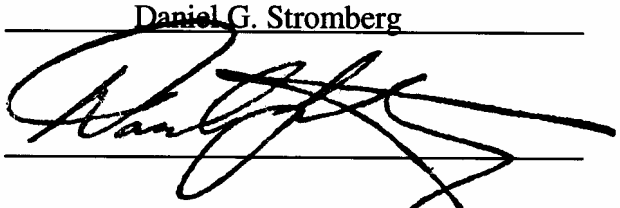
RECOMMENDATIONS:

(A) Although the present extent of pier deterioration has yet to significantly compromise structural integrity, the deterioration has and will continue to progress. If long term serviceability is desired for the structure, consideration should be given to removing all unsound concrete and restoring concrete surfaces by patching and recasting with a concrete mix designed for high durability and low permeability.

(B) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

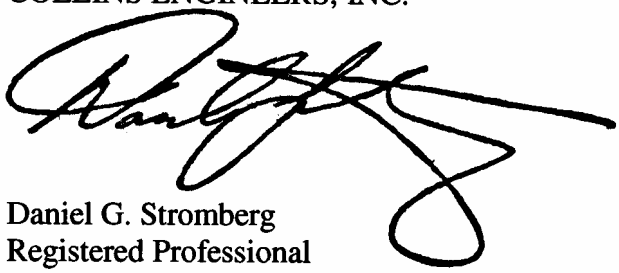
Daniel G. Stromberg



Date 6/30/2008 Registration No. 21491

Respectfully submitted,

COLLINS ENGINEERS, INC.



Daniel G. Stromberg
Registered Professional
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 2366

Feature Crossed: Mississippi River

Feature Carried: MSAS No. 110 - 1$^{ST}$ Street

Location: District 2 - Beltrami County, City of Bemidji

Bridge Description: The bridge superstructure consists of three concrete arch spans. The superstructure is supported on two reinforced concrete abutments and two reinforced concrete piers. The piers are numbered 1 and 2, from west to east. No design drawings with foundation details were provided.

2. INSPECTION DATA

Professional Engineer Diver: Bradley A. Syler, P.E., S.E.

Dive Team: John J. Loftus, Valerie Roustan

Date: August 17, 2007

Weather Conditions: Sunny, 69$^{o}$ F

Underwater Visibility: None/Negligible

Waterway Velocity: 0.5 fps

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Piers 1 and 2, and the East and West Abutments.

General Shape: Piers consist of oblong rectangular shafts with rounded ends. Abutments consist of vertical walls.

Maximum Water Depth at Substructure Inspected: Approximately 5.6 feet.

4. WATERLINE DATUM

Water Level Reference: Top of parapet wall on the North end of Pier 1.

Water Surface: The waterline was approximately 19.0 feet below the reference. Assumed Waterline Elevation 81.0.

5. NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code 6

Item 61: Channel and Channel Protection: Code 6

Item 92B: Underwater Inspection: Code B/08/07

Item 113: Scour Critical Bridges: Code G/07

Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site.

_____ Yes X No

Photograph 1. Overall View of Structure, Looking Northwest.

Photograph 2. View of Pier 1, Looking Southeast.

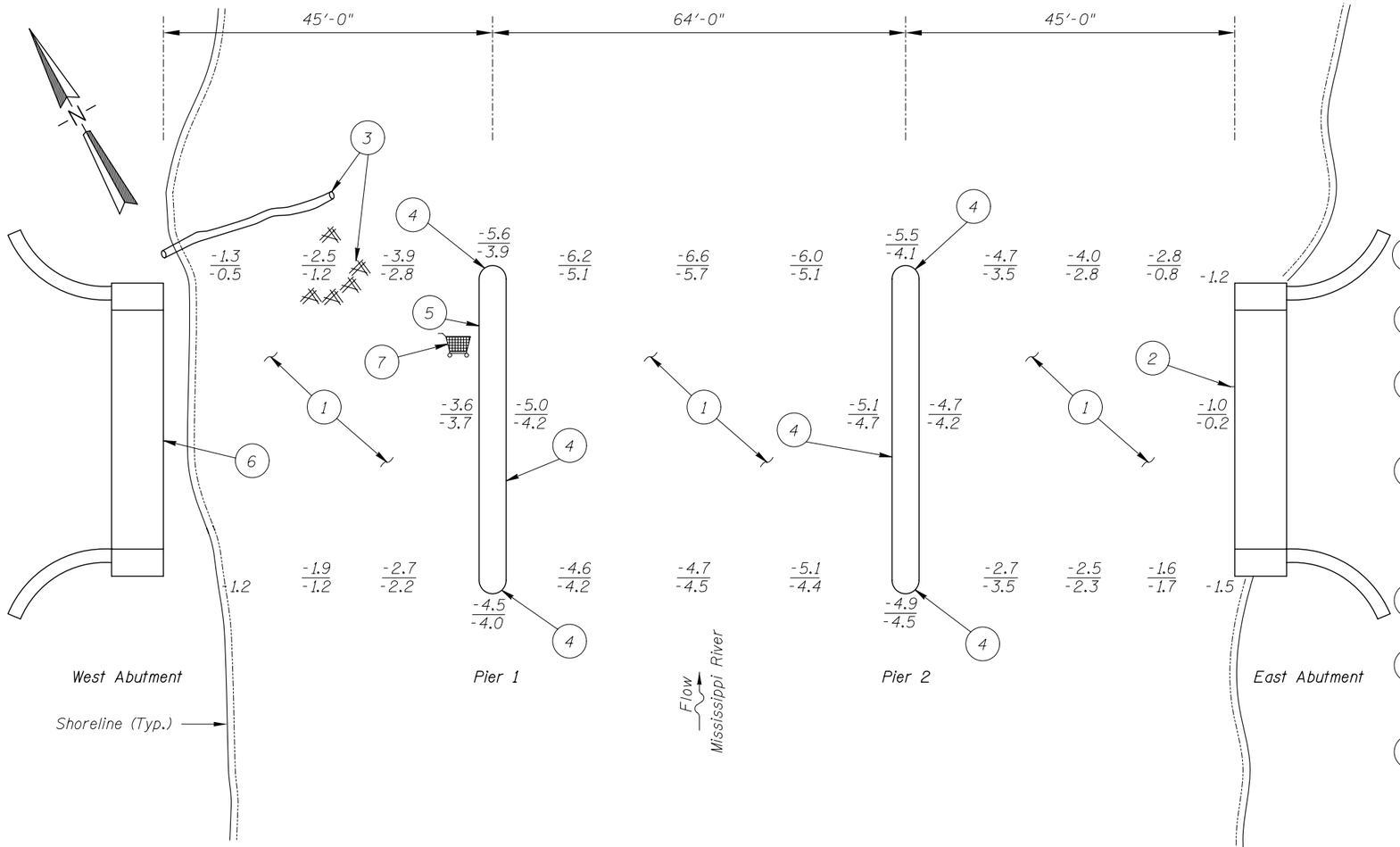
Photograph 3. View of Pier 1, Looking Southwest.

Photograph 4. View of Pier 2, Looking Southeast.

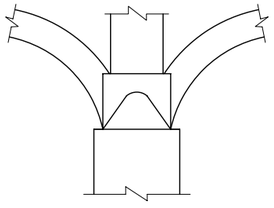
Photograph 5. View of Pier 2, Looking Southwest.

Photograph 6. View of the Downstream Nose of Pier 2, Looking West.

Photograph 8.  View of Spall at West face of Pier 1, Looking West.




SOUNDING PLAN



TYPICAL END VIEW OF PIERS

GENERAL NOTES:

1. The East and West Abutments, and Piers 1 and 2 were inspected underwater.
2. At the time of inspection on August 17, 2007, the waterline was located approximately 19.0 feet below the top of the parapet at the upstream end of Pier 1. Since insufficient bridge elevation information was available a reference elevation of 100.0 was assumed. Based on the assumed reference the waterline elevation was 81.0.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.
4. Soundings were taken parallel to the bridge at 1/4 point intervals between the substructure units.

INSPECTION NOTES:

1. The channel bottom material consisted of firm sandy gravel and cobbles with 2 to 3 inches of probe rod penetration.
2. Below the waterline concrete of the east abutment was smooth and sound with a light layer of aquatic growth and no defects of structural significance observed.
3. A moderated accumulation of timber debris, including a 20-foot-long by 1-foot-diameter log, was observed extending from the West Abutment to the downstream end of Pier 1.
4. Band of scaling, impending spalling, spalling with exposed and corroded rebar, and section loss around both piers typically located between 1 foot below and 3.5 feet above the waterline, with typical penetrations of 2 to 3 inches and maximum penetrations of 6 to 12 inches. The heaviest deterioration was located at the upstream pier noses and along the east side of Pier 1 and the west side of Pier 2.
5. Area of section loss was observed at midpoint on west face of Pier 1, 1 foot long by 2 inch high, 2 feet below the waterline with 2 inches of maximum penetration.
6. Random hairline to 1/16-inch-wide map cracking with light amounts of efflorescence were observed on the west abutment from the channel bottom to 3 feet above the channel bottom.
7. Shopping cart was observed on the channel bottom at the downstream quarter point adjacent to the west face of Pier 1. Other debris was also located randomly between Pier 1 and West Abutment.

Legend

| | |
|---|---|
| -5.0 | Sounding Depth (8/17/07) |
| -5.1 | Sounding Depth (8/28/02) |
| | Timber Debris |

Note:

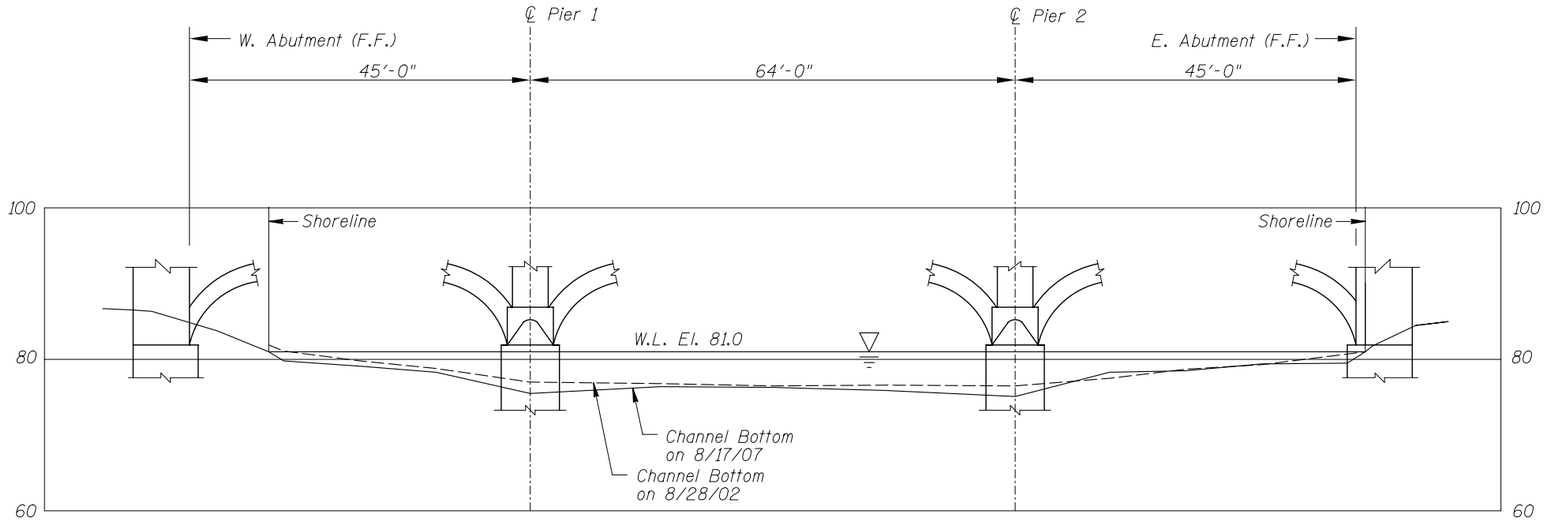
All soundings based on 2007 waterline location.

**MINNESOTA**
**DEPARTMENT OF TRANSPORTATION**
**UNDERWATER BRIDGE INSPECTION**

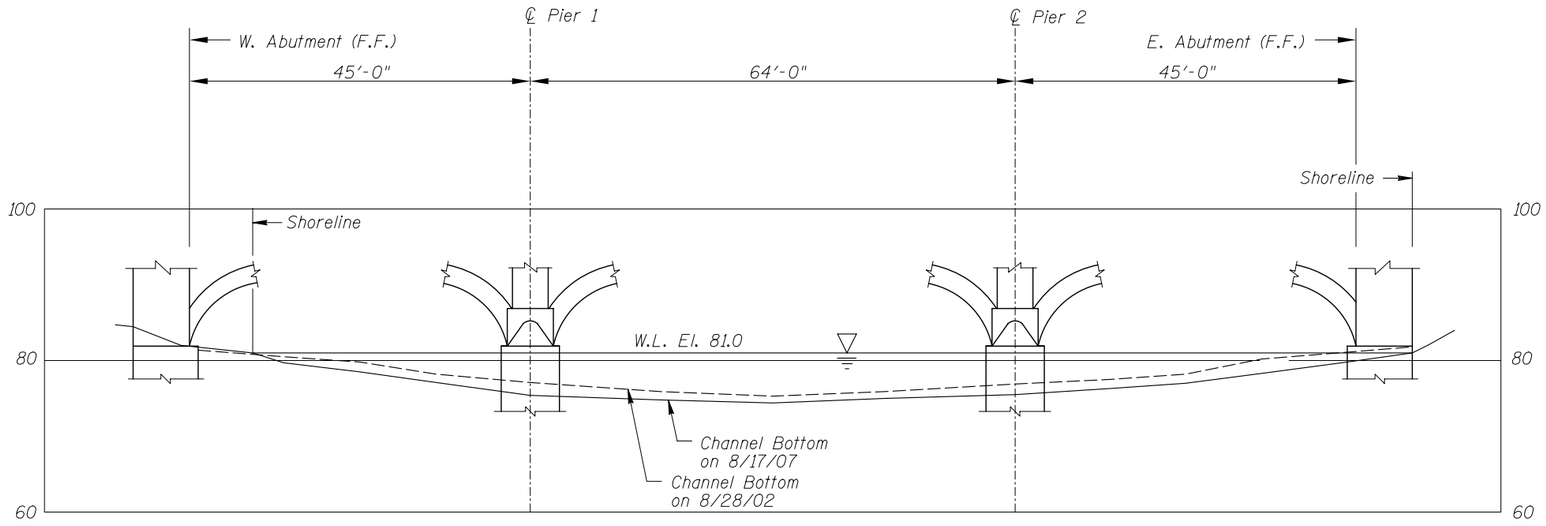
STRUCTURE NO. 2366
OVER THE MISSISSIPPI RIVER
DISTRICT 2, BELTRAMI COUNTY, CITY OF BEMIDJI

INSPECTION AND SOUNDING PLAN

| | | |
|---|---|---|
| Drawn By: PRH | COLLINS ENGINEERS, INC. 123 North Wacker Drive Suite 300 Chicago, Il. 60606 (312) 704-9300 www.collinsengr.com | Date: AUGUST, 2007 |
| Checked By: MDK | | Scale: NTS |
| Code: 52210034 | | Figure No.: 1 |




UPSTREAM FASCIA PROFILE




DOWNSTREAM FASCIA PROFILE

Note:

Refer to Figure 1 for General Notes.

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DISTRICT 2, BELTRAMI COUNTY, CITY OF BEMIDJI

# UPSTREAM AND DOWNSTREAM FASCIA PROFILES

| | | |
|---|---|---|
| Drawn By: PRH | COLLINS ENGINEERS, INC. 123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com | Date: AUGUST, 2007 |
| Checked By: MDK | | Scale: 1"=20' |
| Code: 52210034 | | Figure No.: 2 |

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES
DAILY DIVING REPORT

INSPECTORS: Collins Engineers, Inc. DATE: August 17, 2007

ON-SITE TEAM LEADER: Bradley A. Syler, P.E., S.E.

BRIDGE NO: 2366 WEATHER: Sunny, 69° F

WATERWAY CROSSED: Mississippi River

DIVING OPERATION: X SCUBA _____ SURFACE SUPPLIED AIR

_____ OTHER _____

PERSONNEL: John J. Loftus, Valerie Roustan

EQUIPMENT: Scuba, U/W Light, Scraper, Lead Line, Probe Rod, Camera, Fathometer

TIME IN WATER: 3:45 P.M.

TIME OUT OF WATER: 4:25 P.M.

WATERWAY DATA: VELOCITY 0.5 f.p.s

VISIBILITY None/ Negligible

DEPTH 5.6 feet maximum at Pier 1

ELEMENTS INSPECTED: Piers 1 and 2, East and West Abutments

REMARKS: Overall, the concrete below water was smooth and sound with a light layer of aquatic growth and no defects of structural significance observed. The majority of the deterioration was located from 3.5 feet above the waterline to 1 foot below at the upstream noses and around the waterline along the middle portion of the piers. Typical penetrations for the section loss ranged between 2 and 6 inches with maximum penetrations of 12 inches around the upstream pier noses. Areas of scaling had exposed steel reinforcing with minor section loss. Other defects included random map cracking with efflorescence and some related impending spalls just above the waterline extending below water. A moderate accumulation of debris, including timber drift, assorted garbage, and a shopping cart was observed on the channel bottom between the West Abutment and Pier 1.

FURTHER ACTION NEEDED: _____ YES ___X___ NO

Monitor the extent of the section loss during future inspections, and if found to be significantly progressing, repairs may be warranted to ensure long term serviceability at that time.

Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

# UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 2366
INSPECTORS Collins Engineers, Inc.
ON-SITE TEAM LEADER Bradley A. Syler, P.E., S.E.
WATERWAY CROSSED Mississippi River

INSPECTION DATE August 17, 2007

NOTE: USE ALL APPLICABLE CONDITION DEFINITIONS AS DEFINED IN THE MINNESOTA RECORDING AND CODING GUIDE INCLUDING GENERAL, SUBSTRUCTURE, CHANNEL AND PROTECTION, AND CULVERTS AND WALL DEFINITIONS TO COMPLETE THIS FORM.

## CONDITION RATING

| | | | SUBSTRUCTURE | | | | | | CHANNEL | | | | | GENERAL | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNIT REFERENCE NO. | UNIT DESCRIPTION | MAXIMUM DEPTH OF WATER | PILING | COLUMNS, SHAFTS, OR FACES* | FOOTINGS | DISPLACEMENT | OTHER (BRACING) | OVERALL SUBSTRUCTURE CONDITION CODE* | SCOUR | EMBANKMENT EROSION | EMBANKMENT PROTECTION | OTHER (DRIFT/DEBRIS) | OVERALL CHANNEL & PROTECTION CONDITION | CONCRETE | STEEL | TIMBER | LOSS OF SECTION | PREVIOUS REPAIR OR MAINTENANCE | OTHER |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | Pier 1 | 5.6’ | N | 6 | N | 9 | N | 6 | 8 | N | N | 6 | 6 | 6 | N | N | N | N | N |
| | Pier 2 | 5.5’ | N | 6 | N | 9 | N | 6 | 8 | N | N | 8 | 8 | 6 | N | N | N | N | N |
| | East Abutment | 1.5’ | N | 7 | N | 9 | N | 7 | 8 | 9 | 9 | N | 8 | 7 | N | N | N | N | N |
| | West Abutment | 1.3’ | N | 7 | N | 9 | N | 7 | 8 | 9 | 9 | N | 8 | 7 | N | N | N | N | N |

*UNDERWATER PORTION ONLY

REMARKS: Overall, the concrete below water was smooth and sound with a light layer of aquatic growth and no defects of structural significance observed. The majority of the deterioration was located from 3.5 feet above the waterline to 1 foot below at the upstream noses and around the waterline along the middle portion of the piers. Typical penetrations for the section loss ranged between 2 and 6 inches with maximum penetrations of 12 inches around the upstream pier noses. Areas of scaling had exposed steel reinforcing with minor section loss. Other defects included random map cracking with efflorescence and some related impending spalls just above the waterline extending below water. A moderate accumulation of debris, including timber drift, assorted garbage, and a shopping cart was observed on the channel bottom between the West Abutment and Pier 1.

NOTES: ATTACH SKETCHES AS NEEDED, IDENTIFY REMARK BY REFERRING TO UNIT REFERENCE NO. AND REMARK NO.
USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.